TLH MANAGEMENT SERVICES, INC.

East Oahu Transmission Project – 46kV Phased Project
CABLE REMOVAL PROCEDURES July 21, 2004

TECHNICAL MEMORANDUM

To: Kerstan Wong, Project Manager, Hawaiian Electric Company, Inc.

From: Thomas Harrington, President, TLH Management Services, Inc.

Subject: Cable Removal Procedures for Use of Existing Ducts
Phase 1 - Makaloa Substation to McCully Substation

This memorandum covers the preparation and procedures for removal of the existing 46kV and 12kV circuits from six ducts in an existing common ductline between the Makaloa and McCully Substations. Removal of these existing circuits from the existing ductline will provide available duct space for the two new 46kV underground circuits proposed as part of Phase 1 of the project.

Utilization of existing ductlines is a fairly common practice. Described below, items 1 through 13 are the activities required to remove the existing underground cables and make the existing ducts available for the installation of the proposed 46kV circuits. It is estimated that it will take approximately 10 working days to complete the cable removal and duct preparation activities.

The 10 working day schedule estimate reflects an operation and work environment that is without incident (i.e., there are no collapsed ducts, stuck cables, etc.). If such obstacles are encountered, the procedures will be adapted to provide proper and effective response. The 10 working day schedule further assumes 2 days for initial work set-up, a cable removal rate of 2 spans per day (worked from one manhole), and 2 days for overall cleanup, final disposal work, and other demobilization activities are achieved.

Initial Testing and Manhole Cleaning.

1. Confirm that all circuits are de-energized and all related switches are locked out.
2. Test manhole; confirm conformance with all related safety requirements for work within a confined space as set forth by OSHA/HiOSH.
3. Clean manhole with brush, high pressure water, and remove with pump truck.

4. Test manholes for air quality, to include a specific check for airborne asbestos particulates. Upon confirmation of negative results, (e.g., no asbestos), proceed with cable removal procedures.

Cable Removal (Without Incident)

5. Place approved traffic control at manhole and adjoining receiving area for existing cable to be removed. The size of the receiving area is contingent on the disposal requirements.
    a. If the disposal contractor requires the existing cable to be cut and palletized upon removal, it is likely the removal crew will ask for a lane equal to the length of the cable to be removed; possibly 300' to 400' of one lane width.
    b. If the disposal contractor accepts the removed cables on reels, the removal crew will require a smaller area; possibly 100' – 150' of one lane width.
6. (Repeat) Confirm that all circuits are de-energized and all related switches are locked out.
7. Cut and remove all splices and end terminations.
8. Install and assemble rigging at manhole to facilitate the winch line for cable pulling.
9. It is recommended that a dynamometer be employed for the pulling procedures.
10. Attach winch line to upper-most/nearest cable in the manhole and proceed with pulling.
11. Remove all cables in both directions, and prepare for transport from site (i.e., place the conductor either on pallets or cable reels).
12. Install "p-line", or "mule tape" in each vacant duct for future use.
13. Clean manhole, mandrel test each duct, secure work area, and proceed to next pulling location.

A visual examination of the surface streets along the route of the existing ductline between the Makaloa and McCully Substations found nothing on the surface, such as pavement settlement, erosion, evidence of recent excavation, or the like, to indicate any problematic conditions with the existing ductline. Nonetheless, for planning purposes, the following table contains a list of potential situations that may impede progress and corresponding actions to be taken in the event such situations arise.

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Cable Removal and Duct Preparation Contingencies

Situation	**Response Action**
Asbestos particulates are present in manhole.	• Follow appropriate OSHA/HiOSH and HECO procedures while working in the manhole. In addition, follow applicable requirements of the State of Hawaii Department of Health.
Cable will not move after initial pull.	• Increase pulling force to an acceptable level as determined by the Engineer. (Use of a dynamometer is critical.) • Attempt to pull other cables from same position. Proceed with all successful attempts and return to stuck cables. *The ability, or lack thereof, to remove the other cables, may provide some indication as to why the subject cable(s) may be stuck.*
Cable does not move after initial pull and increased pulling force remedy.	• Attempt to pull stuck cable from a position at the opposite manhole. *This attempt may be accomplished with the use of a second winch or chain hoist.*
Cable remains after applying first two remedial measures.	• Inject water by jetting methods. *The intent is to remove and/or dislodge any foreign material situated in the duct.* • Repeat pulling attempts at the highest allowable force. • Consider use of an eccentric wheel (vibrator) to impart vibration to the cable. • Consider use of a lubricant (polywater).
Collapsed duct is discovered.	• Verify that collapsed duct is not salvageable. • Excavate area. Remove duct utilizing appropriate OSHA/HiOSH and HECO removal procedures for asbestos type duct. In addition, follow applicable requirements of the State of Hawaii Department of Health. • Repair and prove duct.

End of Memorandum